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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/517,171	06/28/2005	Bernd Schumann	10191/3924	7411

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EXAMINER	
SALZMAN, KOURTNEY R	
ART UNIT	PAPER NUMBER
1795	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/517,171	SCHUMANN, BERND	
	Examiner	Art Unit	
	KOURTNEY R. SALZMAN	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *December 7, 2004, January 8, 2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Summary

1. This is the first office action on the merits for application number 10/517,171 entitled Sensor Element for Determining the Oxygen Concentration in the Exhaust Gas of Internal Combustion Engines, filed June 28, 2005.

2. Claims 16-31 are pending and have been fully considered.

Priority

3. This application claims priority to German priority document 102 27 012.0, filed June 18, 2002.

4. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 16-27 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over YAMADA et al (US 6,210,641 B1), in view of KUNIMOTO et al (US 2002/0017461 A1).

YAMADA et al teaches a gas sensor used in a combustion engine. In figure 53B YAMADA et al teaches a cavity A within the electrolytic pieces 91-93. The inner electrode of the pumping cell is found to be 91b, while the outer electrode is 91a found outside the cavity and electrolyte. There are two inlets or diffusion channels, which allow the exhaust gas to feel to chamber A. To reach the cavity, the exhaust gas flows through a catalyst layer, 17, not contained in a chamber.

YAMADA et al fails to teach an explicit prechamber containing a catalyst (functioning as a catalytic converter) and diffusion channel which feeds from the prechamber to the cavity.

KUNIMOTO et al discloses a similar gas sensor containing a cavity 3 with a pumping cell 33 in figure 1. KUNIMOTO et al teaches a prechamber 5, fed exhaust gas through 20. The diffusion channel 6 takes the exhaust gas from the prechamber to the cavity 3. In paragraph 38, KUNIMOTO et al discloses the gas diffusion hole 6 can be loaded with a porous member to control the flow. The porous member 25 in the prechamber functions as a catalytic converter for reducing the incoming exhaust gas.

At the time of invention, it would have been obvious to one of ordinary skill in the art to utilize the prechamber packing of KUNIMOTO et al in the oxygen sensor of YAMADA et al because the organization of the catalytic treatment in a prechamber allows for accurate readings despite high concentrations present. Flow control from the prechamber through the entire chamber of catalyst to the sensor cavity allows for the gases to be more completely reduced, where simply flowing through the catalyst has led to insufficient reduction of gases and therefore interfering gas species during measurement. (KUNIMOTO et al paragraphs 7-9)

Regarding claim 17, YAMADA et al teaches the use of an alumina catalyst (c. 14, l. 21-23) which will oxidize the incoming hydrogen gas. (c. 13, l. 59-61)

Regarding claim 18, figure 1 of KUNIMOTO et al shows the catalyst to fill the entirety of the chamber.

Regarding claims 19 and 20, YAMADA et al also shows the use of inside and outer platinum electrodes covered in catalyst indicating the use of the electrodes for electrochemical catalysis. (c. 11, l. 11-43) KUNIMOTO et al also discloses use of numerous precious metal electrodes in paragraph 64.

Regarding claim 21, these electrodes are explicitly used for oxidation and are shown to be present in figure 3 of KUNIMOTO et al across the chamber as reference number 17.

Regarding claim 22, figure 3 of KUNIMOTO et al shows all the entrances and chamber walls which run the length of the sensor to be substantially parallel.

Regarding claim 23, the center axes of the diffusion channel and the intake opening are shown to be parallel in the figure 1 of KUNIMOTO et al.

Regarding claim 24, figure 1 of KUNIMOTO et al also shows the diffusion passageway 6 to be of a much smaller relative cross sectional area than the prechamber 5.

Regarding claim 25, KUNIMOTO et al teaches the use of direct current power supply as reference numbers 33 and 34 and show in figure 3 to be permanently connected. Circuit 34 moves current from the site of the 34 to the inner electrode to the outer electrode. Due to all the resistance the current will encounter as it moves through the circuit, the voltage would be higher at the source, or at the input, than after flowing through the electrodes.

Regarding claim 26, YAMADA et al teaches a porous ceramic like alumina and a catalytic metal, like Pt-Rh or Pt. A cermet is known in the art to be a mix of a ceramic and metal. Here, the coating is shown to be around the electrodes. (column 19, lines 35-52)

Regarding claim 27, weight is given to the preamble when it discloses structural limitations therefore, in figure 53B YAMADA et al teaches a cavity A within the electrolytic pieces 91-93. The inner electrode of the pumping cell is found to be 91b, while the outer electrode is 91a found outside the cavity and electrolyte. There are two inlets or diffusion channels, which allow the exhaust gas to feel to chamber A. To reach the cavity, the exhaust gas flows through a catalyst layer, 17, not contained in a chamber.

YAMADA et al fails to teach an explicit prechamber containing a catalyst (functioning as a catalytic converter) and diffusion channel which feeds from the prechamber to the cavity.

KUNIMOTO et al discloses a similar gas sensor containing a cavity 3 with a pumping cell 33 in figure 1. KUNIMOTO et al teaches a prechamber 5, fed exhaust gas through 20. The diffusion channel 6 takes the exhaust gas from the prechamber to the cavity 3. In paragraph 38, KUNIMOTO et al discloses the gas diffusion hole 6 can be loaded with a porous member to control the flow. The

porous member 25 in the prechamber functions as a catalytic converter for reducing the incoming exhaust gas.

At the time of invention, it would have been obvious to one of ordinary skill in the art to utilize the prechamber packing of KUNIMOTO et al in the oxygen sensor of YAMADA et al because the organization of the catalytic treatment in a prechamber allows for accurate readings despite high concentrations present. Flow control from the prechamber through the entire chamber of catalyst to the sensor cavity allows for the gases to be more completely reduced, where simply flowing through the catalyst has led to insufficient reduction of gases and therefore interfering gas species during measurement. (KUNIMOTO et al paragraphs 7-9)

YAMADA et al also shows the use of inside and outer platinum electrodes covered in catalyst indicating the use of the electrodes for electrochemical catalysis. (c. 11, l. 11-43) KUNIMOTO et al also discloses use of numerous precious metal electrodes in paragraph 64. KUNIMOTO et al teaches the use of direct current power supply as reference numbers 33 and 34 and show in figure 3 to be permanently connected. Circuit 34 moves current from the site of the 34 to the inner electrode to the outer electrode. Due to all the resistance the current will encounter as it moves through the circuit, the voltage would be higher at the source, or at the input, than after flowing through the electrodes.

Regarding claim 29, as oxidation of hydrogen is the goal of an oxygen sensor, and atomic hydrogen is known to burn above a temperature of 600°C, as stated in c. 15, lines. 64-66 of YAMADA et al, any operation temperature above this temperature would be obvious to one of ordinary skill in the art.

Regarding claim 30, the response time of the system based on the amount of catalyst used is shown in figure 32 of YAMADA et al. Points of the graph show operation far exceeding one minute.

Regarding claim 31, due to the amount of testing required to maintain the air-fuel ratio control system of the catalytic converter of YAMADA et al it would be obvious to repeat the application of voltage for the duration of the engine's requirement for air-fuel ratio calculation. (c. 11, l. 55-c.12, l.13)

8. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over YAMADA et al (US 6,210,641 B1) and KUNIMOTO et al (US 2002/0017461 A1) as applied to claim 27 above, and further in view of NADANAMI et al (US 2002/0092780).

Regarding claim 28, the combination of YAMADA et al and KUNIMOTO et al teaches all the limitations of claim 27.

The combination YAMADA et al and KUNIMOTO et al fails to teach the application of a DC voltage higher than that of the decomposition voltage of the solid electrolyte.

NADANAMI et al teaches the application of a voltage at the level of decomposition of the electrolyte in the sensor in paragraph 17.

It would be obvious to one of ordinary skill in the art to raise the voltage above that of the decomposition voltage if voltage at that level is currently present.

At the time of invention, it would obvious to apply the DC voltage of NADANAMI et al to the sensor of YAMADA et al and KUNIMOTO et al because it causes the successful transport of protons through the sensor, limiting proton current flow, a goal of sensors in the industry.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KOURTNEY R. SALZMAN whose telephone number is (571)270-5117. The examiner can normally be reached on Monday to Thursday 6:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

krs
5/22/2008

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795